

A three-dimensional passive-dynamic walking robot with two legs and knees

SH Collins, M Wise, A Ruina - ... International Journal of Robotics ..., 2001 - ijr.sagepub.com

... Lateral arm motion is one possible **stabilizing** compensa- tion ... speculated that the mass properties of the four-legged design should work reasonably well in our two-legged device, and that we would use trial, error, and **correction** to minimize ... The **gait** is typical of toys of this genre ...

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[PDF] Stable control of a simulated one-legged running robot with hip and leg ...

M Ahmadi, M Buehler - IEEE Transactions on Robotics and Automation, 1997 - Citeseer

... McGeer 11) has built completely un- actuated gravity powered two-legged mechanisms capable of **walking** down inclines. ... The control problem of **stabilizing robot running** with a compliant hip for fore-aft swinging is much more difficult than that for the compliant leg (vertical ...

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Stabilization of lateral motion in passive dynamic walking

AD Kuo - The International journal of robotics research, 1999 - ijr.sagepub.com

... roll and yaw rotation and found it to be unstable but did not offer a **stabilizing** control law ... of $P = 0$ and using as initial guesses the fixed points of the planar passive dynamic **walking** machine ... found two solutions for each α or γ , which were termed long- or short-period **gait** cycles ...

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A new control method for walking robots based on angular momentum

K Mitobe, G Capi, Y Nasu - Mechatronics, 2004 - Elsevier

... the ground reaction force and moment is important in order to control the **angular momentum** of **walking robots**. ... The selection of K ref and 1 depend on the desired **gait**. ... similar with the balance mechanism of humans, where the body balance is maintained by **adjusting** the point ...

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... of a series of compact humanoid robots and development of biped walk control ...

T Furuta, T Tawara, Y Okumura, M Shimizu, K ... - Robotics and ..., 2001 - Elsevier

... 6. When the ESYS humanoid project commenced in 1996, biped **walking** using multiple-link virtual ... **gait** generation was proposed and shown to be successful in realizing various dynamic **walk**. ... The last strategy has provisions for real-time **gait adjustment** due to the existence of ...

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Passive dynamic walking

T McGeer - The International Journal of Robotics Research, 1990 - ijr.sagepub.com

... Again the stance leg is left free. However, the **feedforward** **gait** is unstable, so small feedback corrections are added to maintain the **walking** cycle. ... more pure implementation, and applied them with great success to **running** machines having from one to four legs. ...

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[PDF] A hop towards running humanoid biped

S Kajita, T Nagasaki, K Kaneko, K Yokoi, K ... - ON ROBOTICS AND ..., 2004 - Citeseer

... that these springs help **running** but they might prevent the ordinary humanoid activities including **walking**, carrying objects ... results of forward hopping and introduce an **adjustment** to obtain accurate travel distance. In Section VI, our first attempt to realize **running** is explained. ...

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[PDF] Self-stabilizing running

RP Ringrose - 1997 - dspace.mit.edu

... Similarly, by **correcting** for the interactions between the two bipeds the resulting quadruped runs stably ... the touchdown position of the foot a function of pitch, **stabilizing** the monopod ... passive dynamic **walking** machine walks downhill using an inverted pendulum **gait**, illustrated in ...

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Dynamic walk of a biped

H Miura, I Shimoyama - The International Journal of Robotics ..., 1984 - ijr.sagepub.com

... The most important point is that the mo- tion of either **robot** during the single-leg support phase can be ... Thus, **stepping** must be continued to **walk** or maintain an upright, balanced posture. - Postural state is measured by potentiometers and contact sensors. ...

Cited by 229 - Related articles - All 2 versions

[PDF] Asymptotically stable **walking** for biped robots: Analysis via systems with ...

JW Grizzle, G Abba, F Plestan - IEEE Transactions on Automatic Control, 2001 - Citeseer

... passive is used in the sense that the system is not actuated, but can **walk** down an ... to use in the analysis, namely, the constraints corresponding to an impact with the **walking** surface. ... This will be achieved with the use of finite-time **stabilizing** feedback controllers [23], [4]-[6]. The ...

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[PDF] ... : Humanoid motion planning based on the linear and angular momentum

S Kajita, F Kanehiro, K Kaneko, K Fujiwara, ... - Proceedings of the ..., 2003 - staff.aist.go.jp
... of a perfect multi-purpose machine [1, 2, 3, 4, 5]. However, once we step out the ... In Section 5, using a humanoid robot HRP-2, kicking and walking motions are generated ... proposed a balancing and walking controller based on the CoM manipulation [8]. Both methods mainly ...

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A three-dimensional passive-dynamic walking robot with two legs and knees

SH Collins, M Wisse, A Ruina - The International Journal of ..., 2001 - ijr.sagepub.com
... The gait had a visually appealing swing but was not robust; it only walked the full length of ... Extension 5). At this stage, side-to-side rocking increased from step to step, leading to ... We observed that human arms move in and forward simultaneously while walking naturally, so we ...

Cited by 391 - Related articles - BL Direct

[PDF] Angular momentum regulation during human walking: biomechanics and ...

M Popovic, A Hofmann, H Herr - ... of the IEEE International Conference on ..., 2004 - Citeseer
... that a large class of human movements, including standing, walking and running, support conservation ... due to this assumption are limited to a small part of the gait cycle, and ... simplification, based on observations of human test subjects during normal walking, approximates the ...

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[PDF] ... 3D Linear Inverted Pendulum Mode: A simple modeling for a biped walking ...

S Kajita, F Kanehiro, K Kaneko, K Yokoi, H ... - Proceedings of the ..., 2001 - staff.aist.go.jp
... Figure 5: XY-position and velocity in a walk of the figure 4. The tick line shows x ... The position graphs jump the distance of the step length at each support foot exchange, since are ... $CT = \cosh(T_s - T_c)$ $ST = \sinh(T_s - T_c)$ To control the walking speed, we must change the ...

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Animating human athletics

JK Hodgins, WL Wooten, DC Brogan, JF ... - Proceedings of the 22nd ..., 1995 - portal.acm.org
... These machines walked, jumped, changed gait, climbed stairs, and performed gymnastic maneuvers ([14-16 ... 8]. McMahon provides graphs of stance duration, flight duration, and step length as ... dynamic model and control algorithms to generate the motions of a walking human[...

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Contribution of the support limb in control of angular momentum after tripping

M Pijnappels, MF Bobbert, JH van Dieën - Journal of biomechanics, 2004 - Elsevier
... 1). In about 10 out of 60 walking trials, one of the obstacles suddenly appeared to trip the ... Online kinematic data of each trial were used to calculate the subject's step length and velocity. ... Gait kinematics were recorded during each trial using 4 Optotrak cameras (Northern Digital ...

Cited by 21 - Related articles - All 11 versions

[PDF] Do springboard divers violate angular momentum conservation

C Frohlich - American Journal of Physics, 1979 - physics.princeton.edu
... the body will have rotated a total of 82° between the first and the sixth step, even though his ... diver has angular momentum only about his left-right axis (dotted line) and has no twisting motion. At the instant pictured in (b) he sharply "throws" his left arm down and his right arm up ...

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Synthesis of complex dynamic character **motion** from simple animations

CK Liu, Z Popović - ACM Transactions on Graphics (TOG), 2002 - portal.acm.org

... This paper strives to make a **step** in that direction. ... Less energetic motions such as **walking** or **reaching** are not addressed in this paper. ... fine-tuned and synchronized to each other, a wide range of realistic anima- tions can be produced, ranging from human **running**, diving [Hod ...

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Role of **arm motion** in the standing long jump

BM Ashby, JH Heegaard - Journal of biomechanics, 2002 - Elsevier

... four cameras, a force platform, passive reflective markers, and a computer **running** a software ... into the motor control principles of activities involving both upper and lower body **motion**. **Angular momentum** analyses would be helpful in quantifying the effects **arm swing** has upon ...

Cited by 25 - Related articles - All 10 versions

Effects of extremity loading upon energy expenditure and **running** mechanics

AD CLAREMONT, SJ HALL - Medicine & Science in Sports & ..., 1988 - journals.lww.com

... for a kilogram of weight added to the feet or hands during **walking** and **running** ... considering that the major axis of rotation for the lower extremity during **running** is at ... Since upper extremity **movement** during **locomotion** serves largely to generate **angular momentum** counter- acting ...

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[PDF] ... : Humanoid **motion planning** based on the linear and **angular momentum**

S Kajita, F Kanehiro, K Kaneko, K Fujiwara, ... - Proceedings of the ..., 2003 - staff.aist.go.jp

... 11, j m l -- O **Extremity Body** ... kick kick Figure 5: Reference velocity of right foot (ref F1 **upper graph** of Figure 6 shows the corresponding lin- ear **momentum** during this action. ... To achieve this, the robot throws back its **body** when it swings the leg back, and the 1648 Page 6. ...

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A three-dimensional passive-dynamic **walking robot** with two legs and knees

SH Collins, M Wisse, A Ruina - The International Journal of ..., 2001 - ijr.sagepub.com

... It is missing **upper body parts** and degrees of freedom. ... from gravity, with no ankle extension or torques to accelerate leg swinging, which affects the device's **motion**. Even within our limited design parameters, the best- functioning **arm motions** are backward compared to anthropo ...

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A new control method for **walking robots** based on **angular momentum**

K Mitobe, G Capi, Y Nasu - Mechatronics, 2004 - Elsevier

... The **upper body motion** is generated such that the ZMP follows the prescribed trajectory [1 and 2]. When a ... In order to achieve stable **motion**, an accurate tracking control is needed ... **Angular momentum** is a useful physical quantity for generating the **gait** of bipedal **walking robots** [5 ...

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Synthesis of complex dynamic character **motion** from simple animations

CK Liu, Z Popović - ACM Transactions on Graphics (TOG), 2002 - portal.acm.org

... center of mass (COM) of the lower **body**, COM of the **upper body**, and COM of ... in the event that the animator's keyframe poses force the character into unrealistic **movement**. ... they provide scaffolding for the **motion**, whereas dynamic constraints ensure realistic **motion** during each ...

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Dynamic stability in elders: **momentum control** in locomotor ADL

BK Kaya, DE Krebs, PO Riley - JOURNALS ..., 1998 - biomedgerontology.oxfordjournals. ...

... In addition, the chair height may not have been sufficiently low to challenge lower **extremity strength**. ... turn control than exhibited in the sagittal and vertical planes (Table 4). The **upper body** of BVH ... leg and rotation of the **body** laterally to overcome the inertia of the **body mass** as ...

Cited by 49 - Related articles - BL Direct - All 5 versions

An analysis of parkinsonian **gait**

E Knutsson - Brain, 1972 - Oxford Univ Press

... The mean angle between **upper arm** and lower **arm** at peak extension was 177° + 12° and at ... limb support, symmetry of steps and sagittal rotations in the joints of the **upper** and lower ... When the **body** is raised over the other limb after its weight acceptance, forward progression is ...

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Animating human athletics

JK Hodgins, WL Wooten, DC Brogan, JF ... - Proceedings of the 22nd ..., 1995 - portal.acm.org

... swinging of the legs. However, the details of the **motion** of the **upper body** are not constrained by the dynamics of the task and amateur athletes use many different styles of **arm motion** when they run. Observations of human runners ...

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Goal-directed, dynamic animation of human **walking**

A Bruderlin, TW Calvert - ... of the 16th annual conference on ..., 1989 - portal.acm.org

... movements not involving coordination between several limbs (eg raising an **arm** or dropping an **arm** under the ... phase of a locomotion sequence is reached, ie the forward velocity of the **body** as a ... 4.2 Stance Phase During stance the **upper body** is balanced by the torque F_0

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Patterns of spinal **motion** during **walking**

J Crosbie, R Vachalathiti, R Smith - *Gait & Posture*, 1997 - Elsevier

... was defined in terms of the relative **motion** between the relevant thigh rigid **body** and the ... 6). The **upper** and lower trunk segments were in a neutral orientation with respect to ... be explained in terms of an overall conservation of **angular momentum**, with **arm swing** affecting these ...

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Stabilization of lateral **motion** in passive dynamic **walking**

AD Kuo - *The international journal of robotics research*, 1999 - ijr.sagepub.com

... The pelvis is fixed to the **upper** end of the stance leg, point P, and is modeled as ... These equations were derived using a custom software package for rigid **body** dynamics (Kuo 1997 ... A full **swing** comprises the **motion** of the machine starting from the initial double-support position ...

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